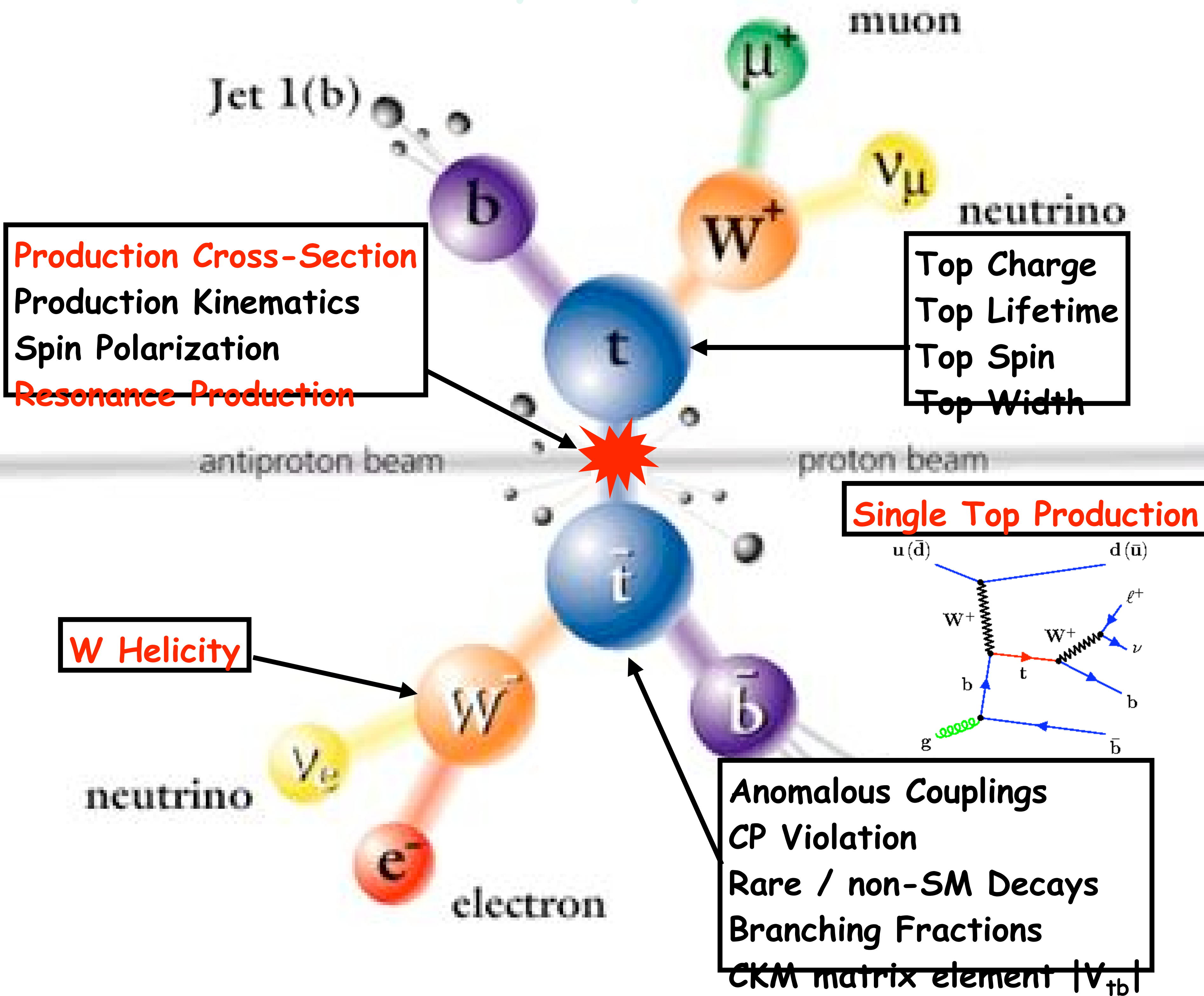


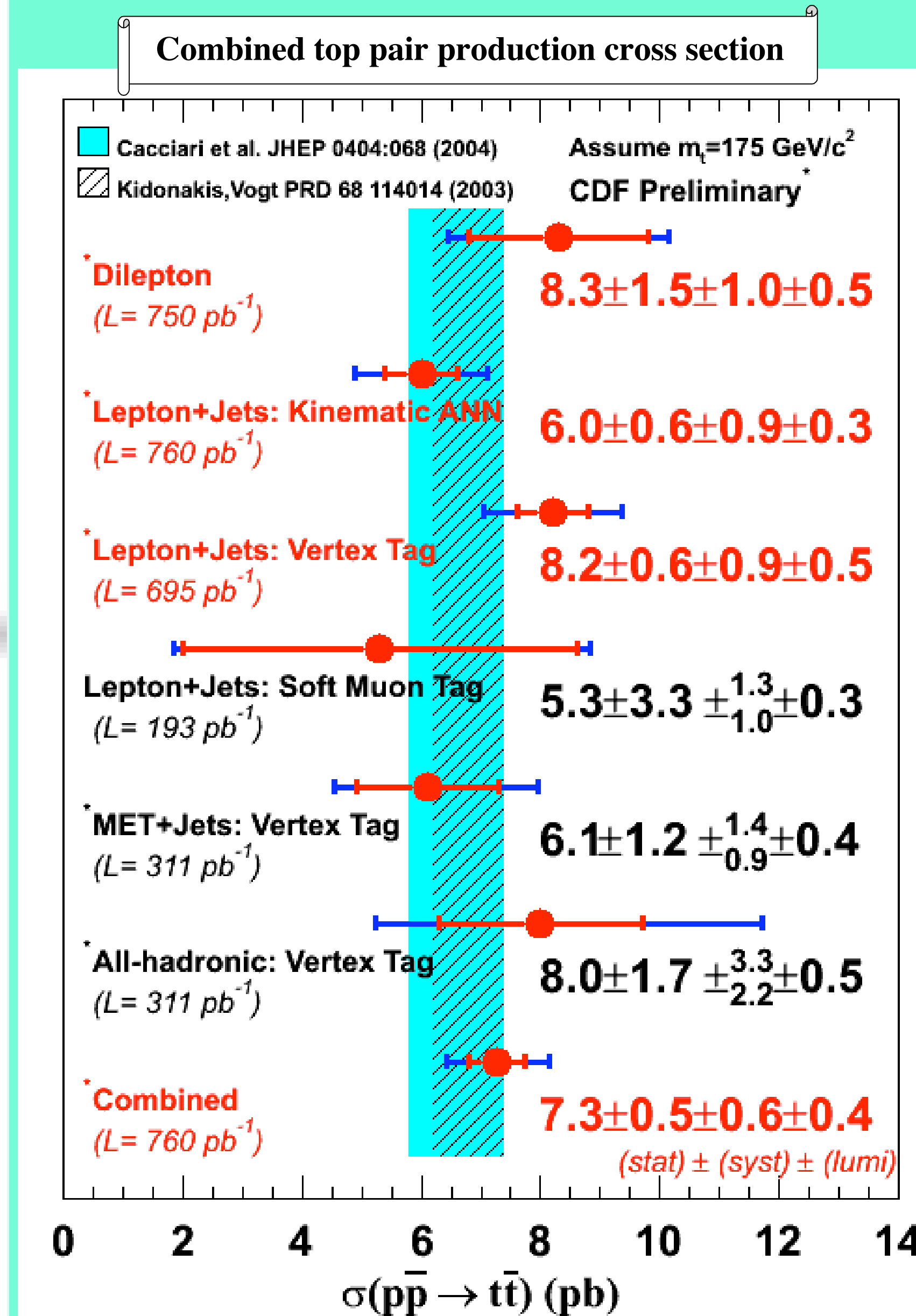
# Top Quark Physics at CDF

## Top Quark Properties

Studied directly only at the Tevatron!



## Top quark pair production cross-section

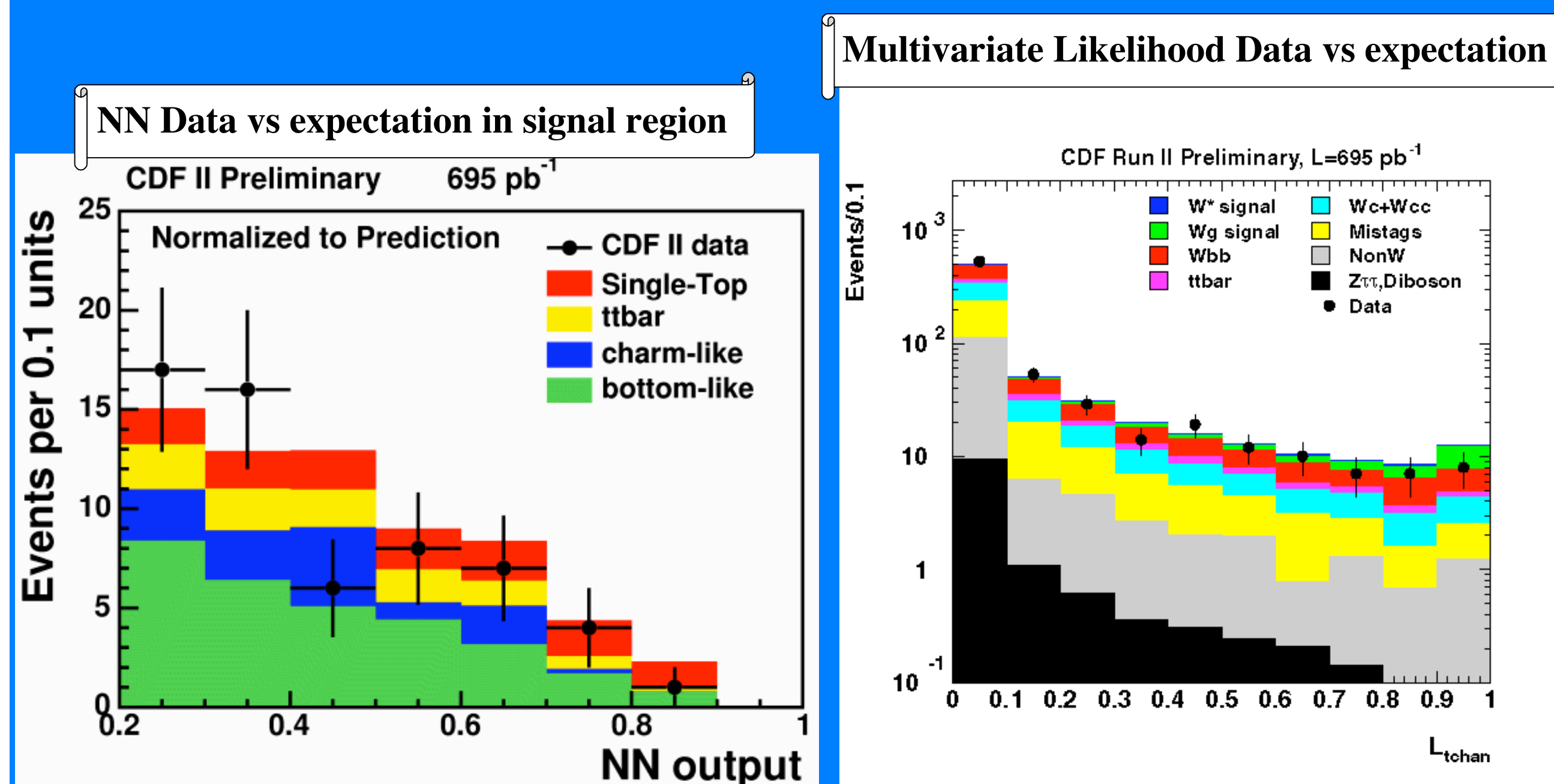


- Used integrated luminosity is up to 760 pb<sup>-1</sup>
- CDF measured tt production cross section using various decay channels and techniques.
- Sensitive to new physics at the production and/or decay (e.g. tt resonance or charged Higgs)
- Current result is consistent with theoretical prediction

$$\sigma_{tt} = 7.3 \pm 0.9 \text{ pb} @ M_{top} = 175 \text{ GeV}/c^2$$

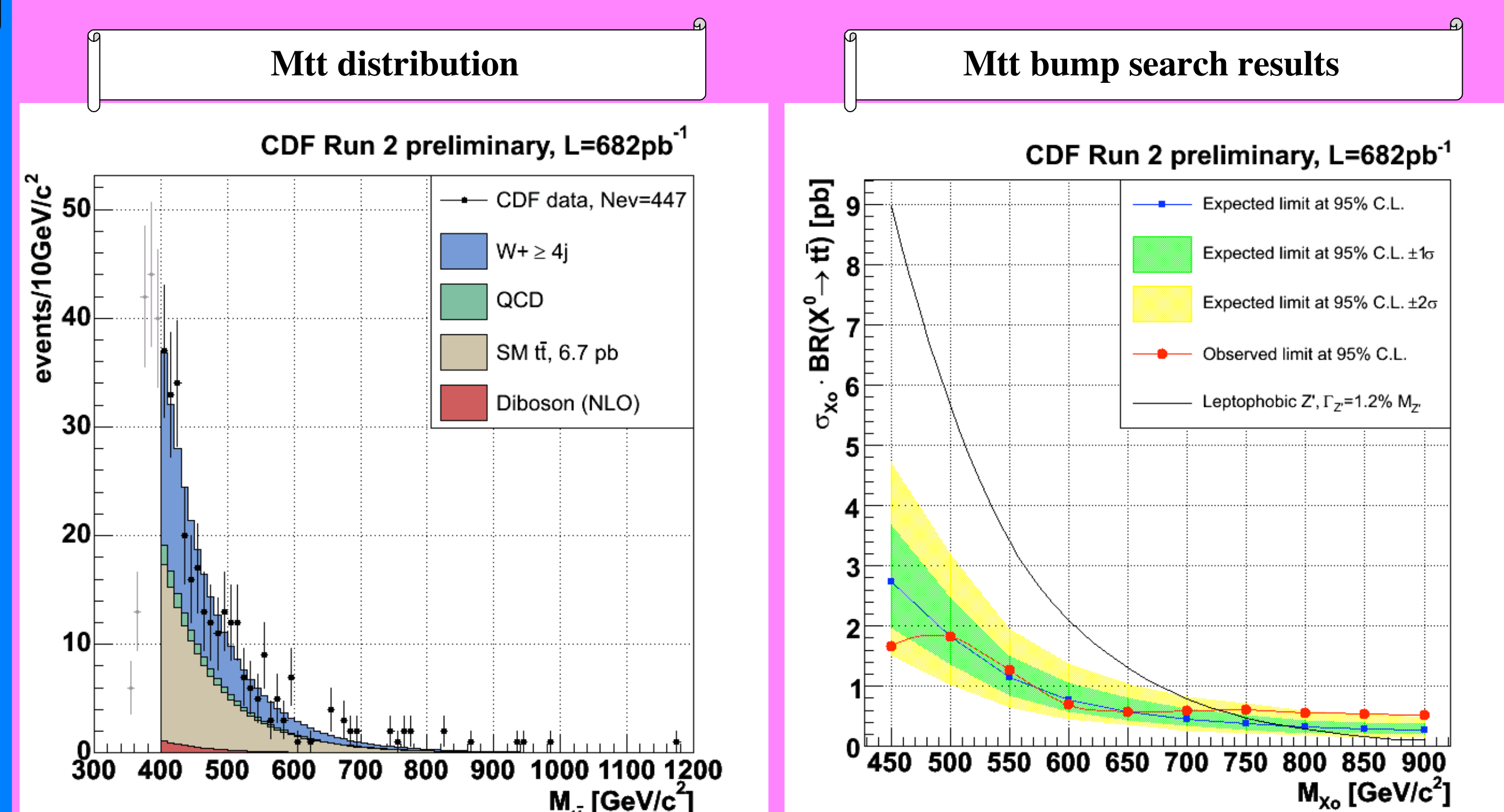
## Search for Single Top Production

- Integrated luminosity: ~0.7 fb<sup>-1</sup>
- Important test of SM electroweak
- The only direct measurement of CKM matrix element  $|V_{tb}|$
- Sensitive to 4th generation, FCNC, W', H+
- Two different multivariate techniques
  - Neural-Networks discriminants
  - Multivariate likelihood



## Search for ttbar Resonance

- Integrated luminosity: ~680 pb<sup>-1</sup>
- Many models predict new particles preferentially coupled to top pair
- E.g. vector gauge bosons:
  - Z' (topcolor, color singlet)
  - Topgluon (topcolor, color octet)
- Can see the effects for mass below 1TeV!
- lepton + ≥4jets channel
- Mtt via Matrix Element

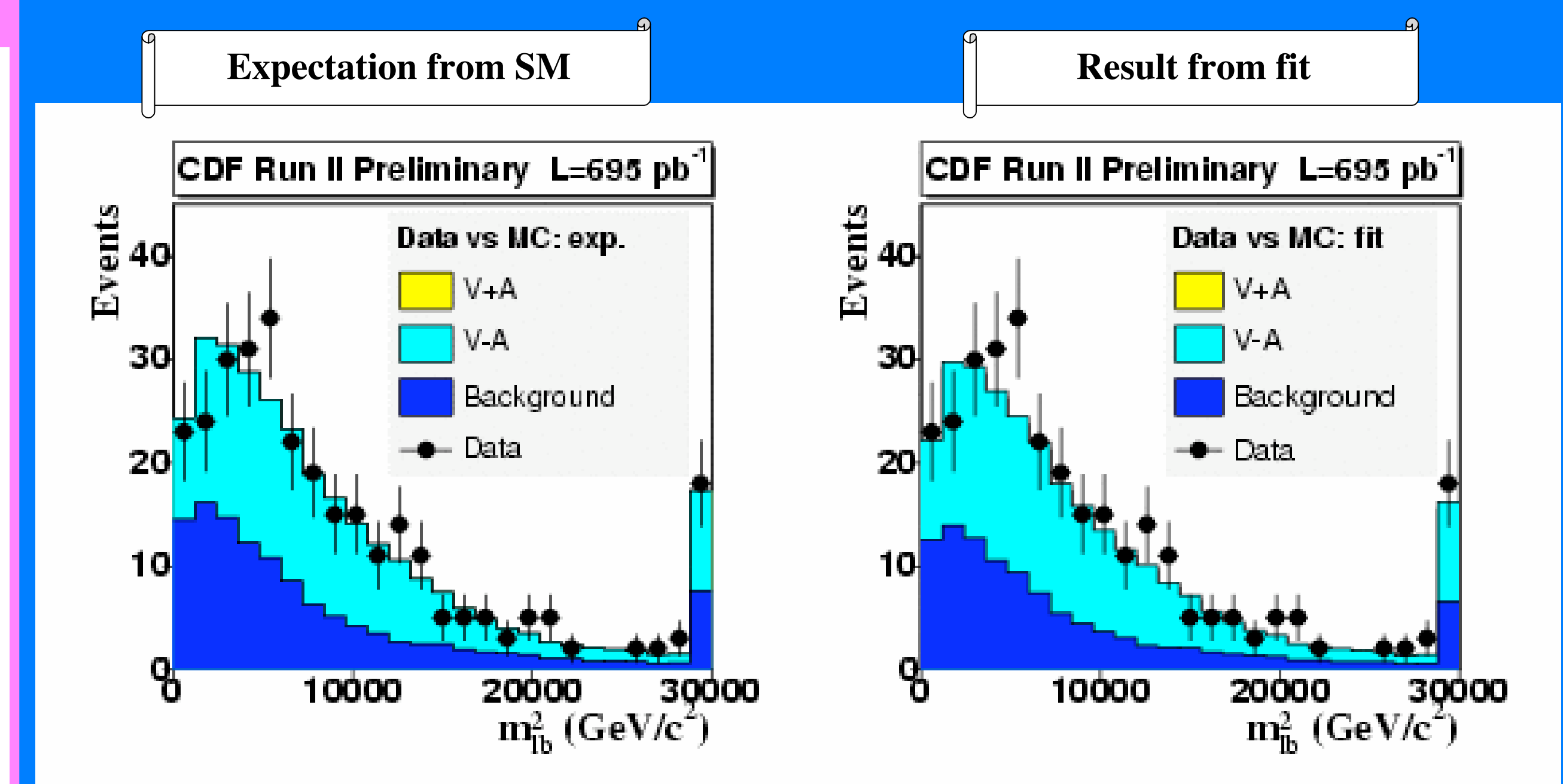


Leptophobic Topcolor Z' mass limit

$$M(Z') > 725 \text{ GeV}/c^2 @ 95\% \text{ C.L.}$$

## W helicity measurement

- Integrated luminosity: ~680 pb<sup>-1</sup>
- SM requires 0 or -1 W boson helicity state from top quark decay since b-quark from top quark decay has -1/2 helicity
- Some non-SM predict +1 W boson helicity
- CDF checks W helicity from decay products of tt events
- lepton + jets & Dilepton channels
- $M_{lb}^2$  is fitted by the template



$$\begin{aligned} t\text{-channel} &< 2.9 \text{ pb} \\ s\text{-channel} &< 3.2 \text{ pb} \\ s+t \text{ channel} &< 3.4 \text{ pb} \\ &@ 95\% \text{ C.L.} \end{aligned}$$

$$\begin{aligned} f(V+A) &= -0.06 \pm 0.25 \\ f(V+A) &< 0.29 @ 95\% \text{ C.L.} \end{aligned}$$